

HWP C Accounting Considerations

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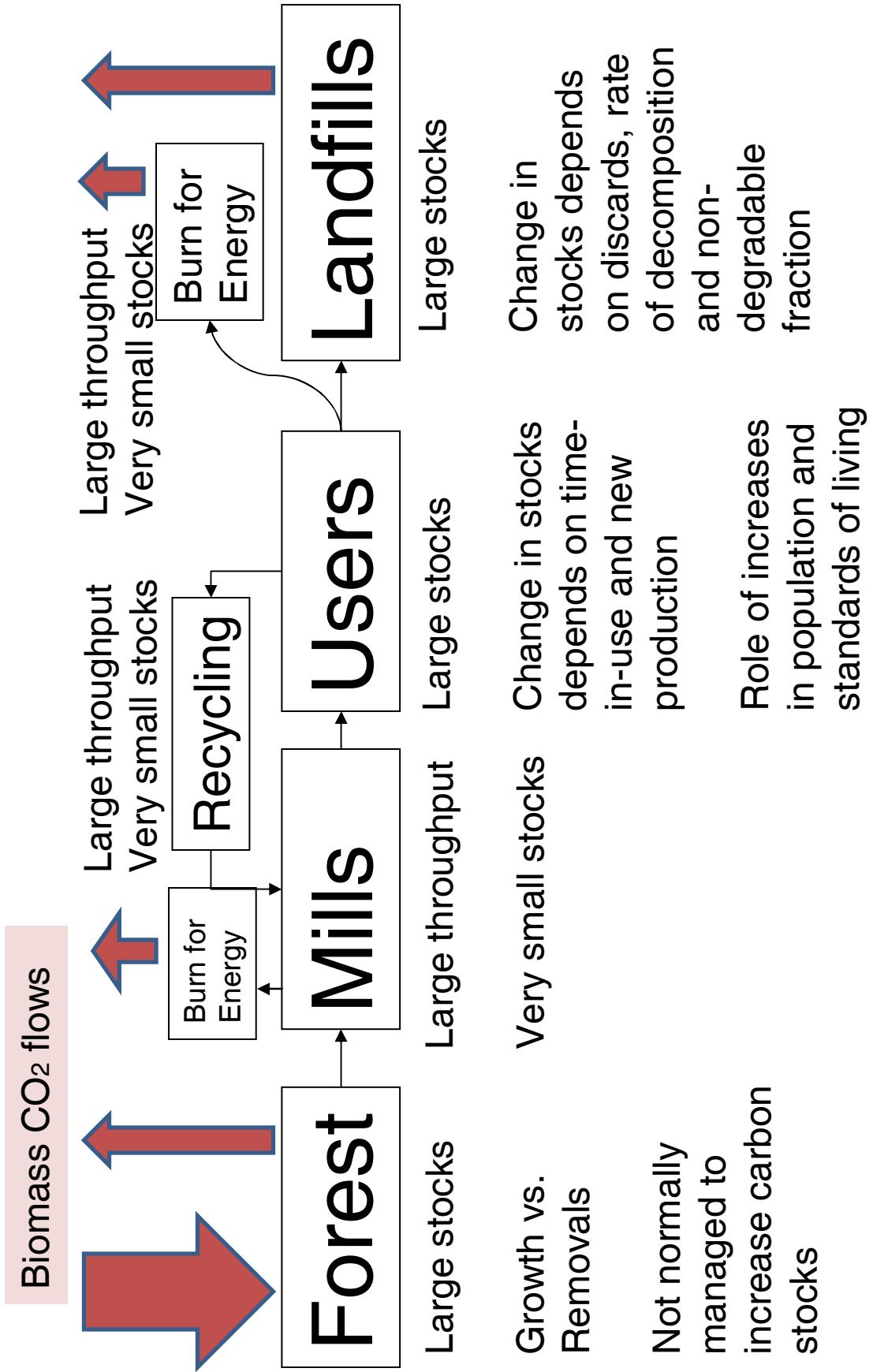
June 18, 2008

Based on presentation by Reid Miner, NCASI

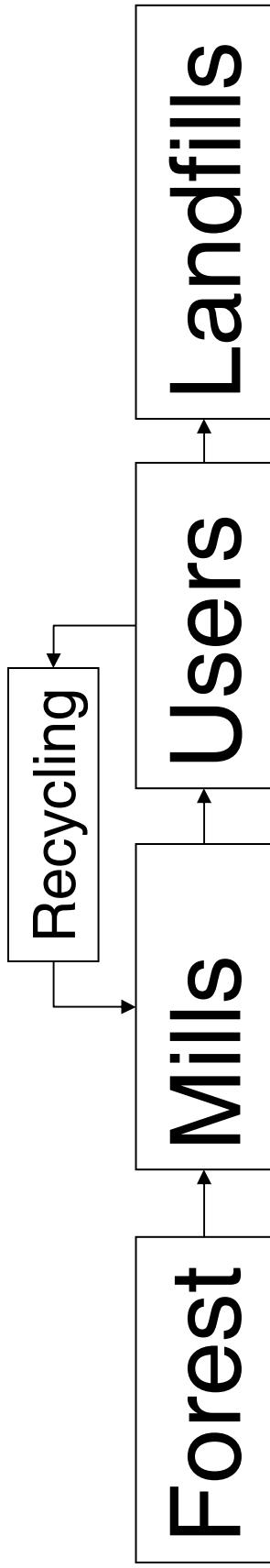
Today's presentation

- Overview of carbon in the forest products value chain
- The importance of carbon in products-in-use
- Very brief 101 on stock vs. flow accounting
- Methods for characterizing carbon in products-in-use
 - Real-time changes in current stocks (national inventory method, CCAR-recommended method)
 - Projected future changes in stocks (100-year method)
- Considerations in using the 100-year method

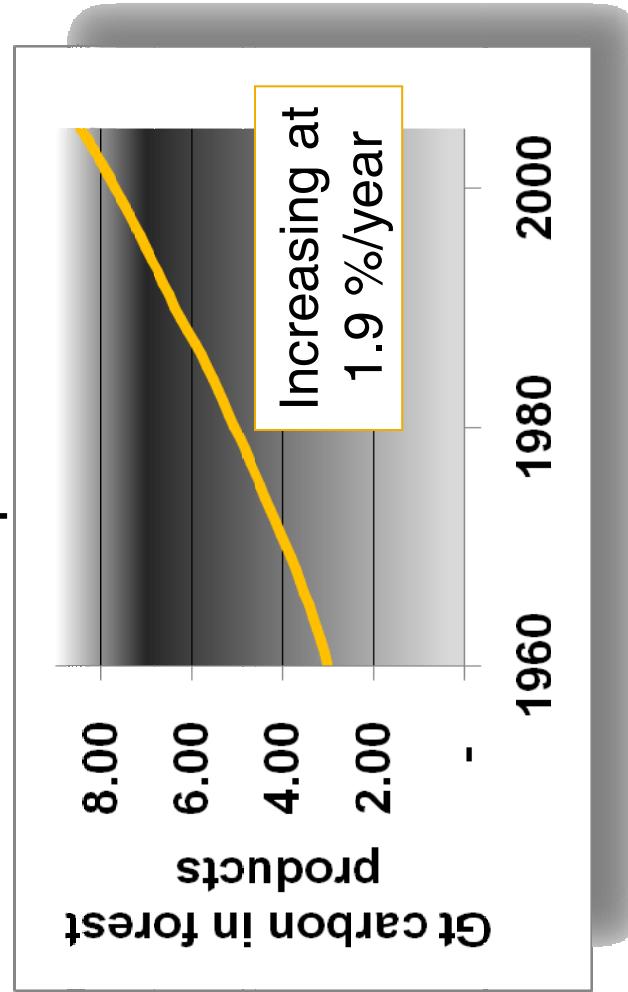
Biomass carbon in the forest products value chain



The importance of carbon in products-in-use



- To understand forest carbon, you need to look beyond the forest
- Is the carbon in products-in-use worth worrying about?



And in the forest?

Latest IPCC Assessment- Table 7.1

	TAR	TAR revised*	TAR	1990s	2000–2005G
	TAR	TAR	TAR	AR4	AR4
Atmospheric increase ^a	3.3 ± 0.1	3.3 ± 0.1	3.2 ± 0.1	3.2 ± 0.1	4.1 ± 0.1
Emissions (fossil + cement)†	6.4 ± 0.3	5.4 ± 0.3	6.4 ± 0.4	6.4 ± 0.4	7.2 ± 0.3
Net ocean-to-atmosphere flux ^a	-1.9 ± 0.6	-1.9 ± 0.8	-1.7 ± 0.5	-2.2 ± 0.4	-2.2 ± 0.5
Net land-to-atmosphere flux ^a	-0.2 ± 0.7	-0.3 ± 0.9	-1.4 ± 0.7	-1.0 ± 0.6	-0.9 ± 0.8
Partitioned as follows					
Land use change flux	1.7 (0.6 to 2.5)	1.4 (0.4 to 2.3)	n.a.	1.8 (0.5 to 2.7)	n.a.
Residual terrestrial sink	-1.9 (-3.8 to -0.3)	-1.7 (-3.4 to -0.2)	n.a.	-2.6 (-4.3 to -0.9)	n.a.

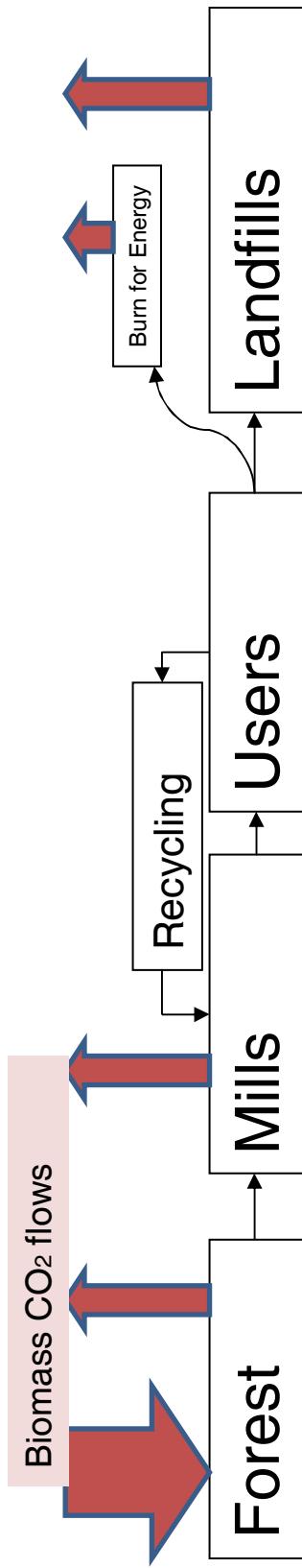
Land-use Change Flux- Emissions resulting from changing land-use
(deforestation – afforestation)

Residual Terrestrial Sink- Growth of net growth and emissions from remaining
terrestrial ecosystems.

Carbon Accounting 101

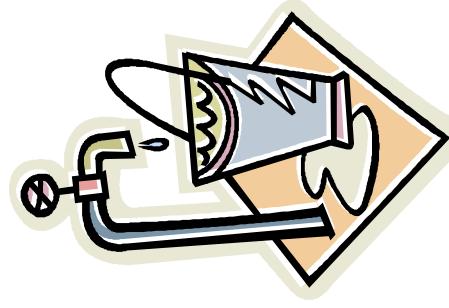
- Flow Accounting
- Stock Change
 - Past to current
 - Current to future

Calculating the effects on the atmosphere



Can calculate net effect on atmosphere by

- estimating the biomass CO₂ flows (Water in- water out)
 - Forest= gross primary production – respiration – decay
 - Production flow (carbon in harvest stored until decay/emission occurs)
 - estimating the net changes in total stocks of carbon stored in the forest, products-in-use, and products in landfills (Water in bucket time a- water in bucket time a-1)
 - Forest= change in various carbon pools
 - Products= change in product pools (in-use, land-fill)
- STOCK CHANGE GENERALLY USED for forest and product**
- Note: if not in a measured pool considered already in atmosphere



For Products- IPCC has Three Approaches

- Stock-Change (changes in stocks in the consuming country)
 - = Δ stocks of products in use + Δ stocks products in land-fill
- Production (changes in stocks in producing country)
 - = Δ stocks of products from domestic harvest in use + Δ stocks products from domestic harvest in land-fill
- Atmospheric-flow (estimates flux to and from the atmosphere and reports where and when these removals and emissions occur)
 - = Domestic harvest – annual emissions from firewood, products in-use and products in land-fill

Options for characterizing carbon storage in products-in-use

- Estimate real-time-changes in current stocks of carbon in products-in-use
 - The “national inventory method”- US uses production approach
 - The California Climate Action Registry recommended method
- Estimate future changes in stocks of carbon in products-in-use
 - The 100-year method

The National Inventory Method

- IPCC' national inventory method reconstructs existing carbon stocks by going back to 1900 and annually adding new production and removing a fraction of the existing stock.

Can the national inventory method be used by corporations?

- Companies know new production, but...
- Companies don't know losses from existing stocks
 - No way to estimate or reconstruct current stocks attributable to company's past production
 - Corporate mergers, spin-offs, etc.

California Climate Action Registry recommended method

- CCAR recommends variation on national inventory method
- CCAR method begins accumulating stocks when a company enters the program
 - Avoids problem with not knowing the size of the pool of carbon associated with past production, but...
 - Results in troublesome “start-up effect”

CCAR recommended method - The start up effect

- Consider annual production of 10 and losses from use = 10% of existing stocks at start of year
 - Year one: 10 in, 0 out, stock change = +10
 - Year two: 10 in, 1 out, stock change = +9
 - Year three: 10 in, 1.9 out, stock change = +8.1
 - Year ten: 10 in, out 6.9, stock change = +3.1
 - Year twenty: 10 in, out 8.6, stock change = +1.4
- Very undesirable feature to have in a corporate accounting method

Estimating future changes in carbon stocks – The 100-year method

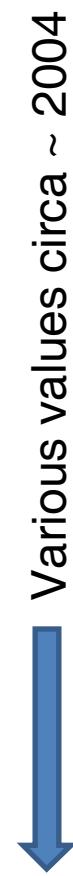
- Use time-in-use information to estimate the amount of carbon in new production that is expected to remain in use for at least 100-years
 - First used by Georgia-Pacific Corp.
- Requires no information on stocks attributable to past production
- Reflects attributes of new production, not impacted by past production (improvement opportunities)
 - Simple, transparent, reproducible
 - Allowed under U.S. 1605b reporting program

Half-lives of forest products

	Half-life of carbon (years)
Half-lives for primary products IPCC Defaults (IPCC 2003a)	
Saw wood	35
Veneer, plywood and structural panels	30
Non-structural panels	20
Paper	2

Half-lives for specific end uses in the U.S.
(Skog and Nicholson 1998)

Single-family homes (post-1980)	100
Multifamily homes	70
Mobile homes	20
Nonresidential construction	67
Pallets	6
Furniture	30
Paper	1 to 6



Recent values based on US Forest Service analysis (used in 2005 US Greenhouse Gas Inventory



Table A-200. Half-life of solidwood and paper products in end uses

Parameter	Value	Units
Half life of wood in single family housing 1920 and before	78.0	Years
Half life of wood in single family housing 1920 - 1939	78.0	Years
Half life of wood in single family housing 1940 - 1959	80.0	Years
Half life of wood in single family housing 1960 - 1979	81.9	Years
Half life of wood in single family housing 1980 +	83.9	Years
Ratio of multifamily half live to single family half life	0.61	
Ratio of repair and alterations half life to single family half life	0.30	
Half life for other solidwood product in end uses	38.0	Years
Half life of paper in end uses	2.54	Years

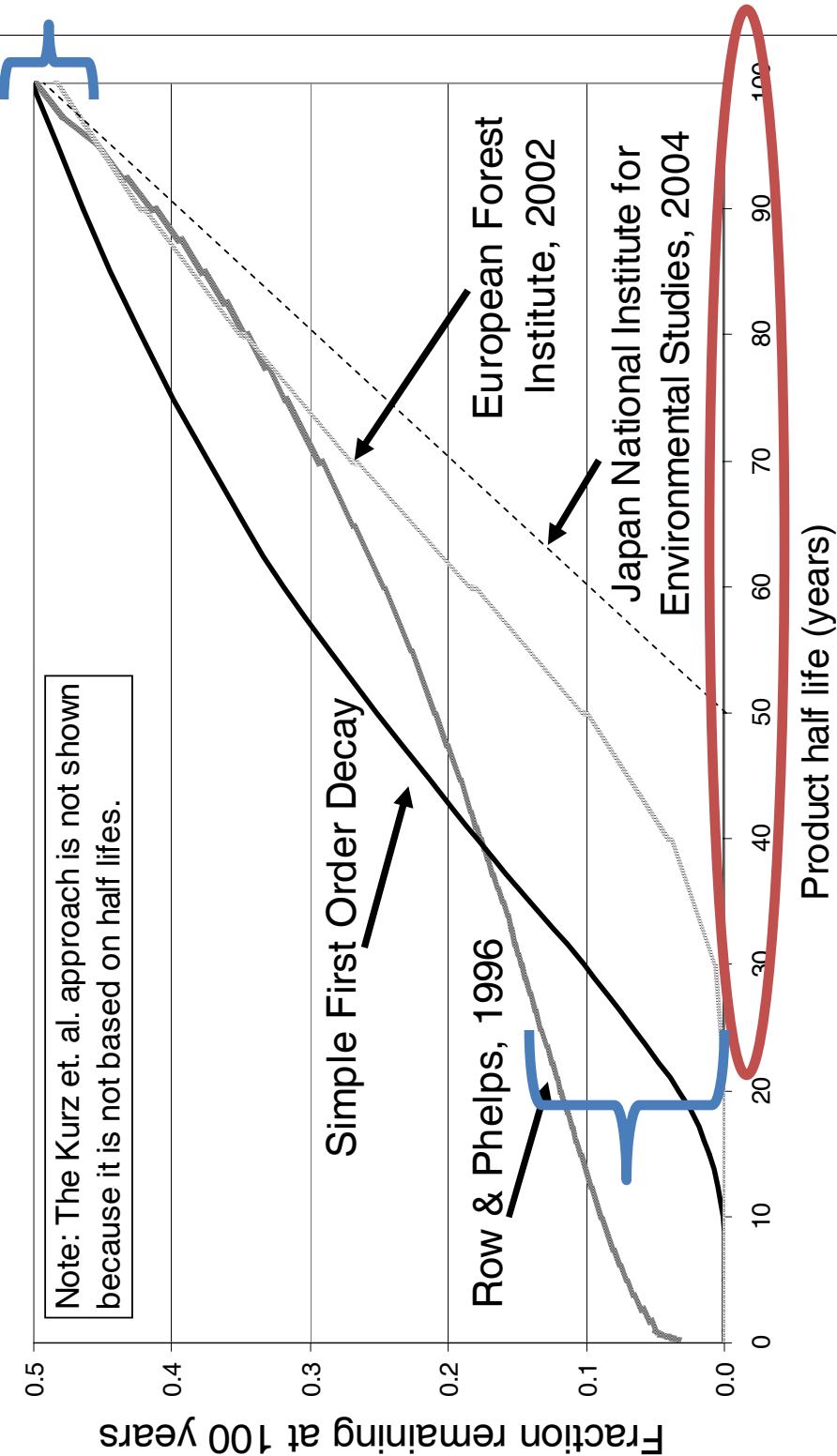
Table A-201. Parameters determining decay of wood and paper in SWDS

Parameter	Value	Units
Percentage of wood and paper in dumps that is subject to decay	100%	
Percentage of wood in landfills that is subject to decay	23%	
Percentage of paper in landfills that is subject to decay	56%	
Half life of wood in landfills / dumps (portion subject to decay)	29	Years
Half life of paper in landfills/ dumps (portion subject to decay)	14.5	Years

Half-lives for Canadian inventory (Kurz et al. 1992)	
Construction lumber	60
Other lumber	< 1
Paper	1

How much is left at 100 years?

Figure 2. Fraction remaining at 100 years for different half-lives



Most half-lives for wood products fall in this range

Implications of the 100-year method

What does HWP C storage using 100 year method mean?

The amount of C from a log OR product that remains in-use after 100 years. Every other part of that log has been emitted into the atmosphere for this accounting

Why 100 years?

100 years standard basis for calculating Global Warming Potential. Roughly equivalent to residence time of CO₂ in atmosphere

General issues related to carbon in products

- Who gets the credit ?
 - Forest owner? (this is approach in 1605b program)
 - Primary manufacturer? (lumber mill- 1605b has calculations that start from wood product as well as from log)
 - Secondary manufacturer? (wood treater)
 - Lumber retailer?
 - Builder?
 - Home owner?
- What about carbon in landfills?
 - This is a large part of the total carbon sequestration in products
 - Who gets the credit? (in 1605b, forest owner)
 - Who gets the methane liability? (in 1605b, landfill owner)

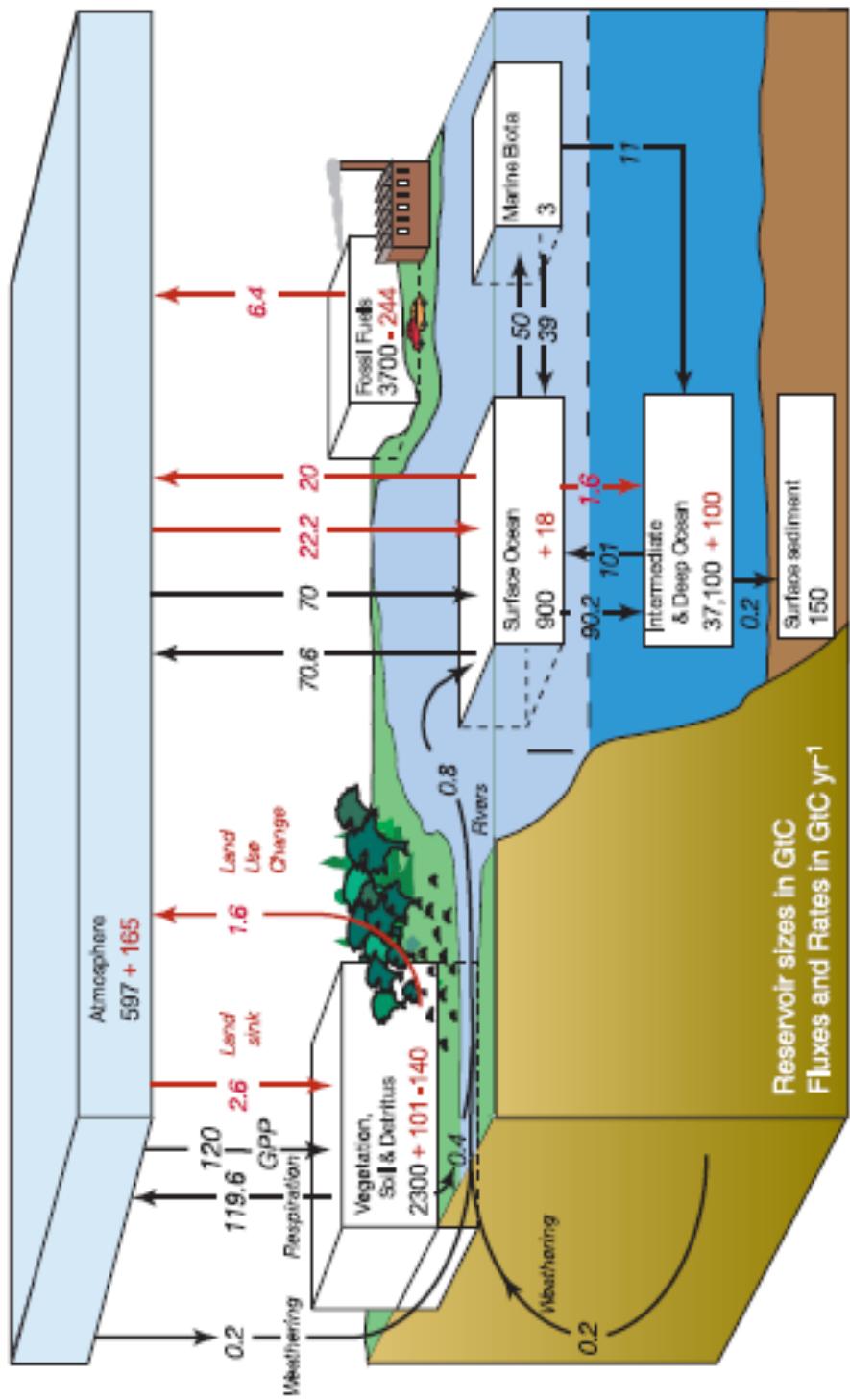
Summary

- Large amounts of carbon are stored in forest products
 - Wood products store carbon in use and in landfills
 - Paper products store carbon primarily in landfills
- The 100-year method provides a method for including carbon storage in corporate inventories
- 10% to 40% of carbon in original wood remains in use for 100 years, which means that...
 - For every ton of lumber produced, between 0.2 and 0.7 tons of CO₂ are stored in products-in-use and kept out of the atmosphere for 100 years.

Summary

IPCC 2007 WG1- Scientific Report, Chapter 7, figure 7.3

Couplings Between Changes in the Climate System



US numbers for Product and Forest

US Greenhouse Gas Inventory Reports: 1990-2006, EPA (2008)

Table 7-6. Net Annual Changes in C Stocks (Tg CO₂/yr) in Forest and Harvested Wood Pools

Carbon Pool	1990	1995	2000	2001	2002	2003	2004	2005	2006
Forest	(489.1)	(540.5)	(436.8)	(529.0)	(598.0)	(635.1)	(635.1)	(635.1)	(635.1)
Aboveground Biomass	(287.6)	(318.4)	(335.4)	(367.7)	(384.4)	(406.5)	(406.5)	(406.5)	(406.5)
Belowground Biomass	(54.2)	(62.4)	(67.2)	(73.7)	(76.9)	(80.9)	(80.9)	(80.9)	(80.9)
Dead Wood	(40.1)	(57.5)	(44.9)	(50.0)	(53.0)	(56.9)	(56.9)	(56.9)	(56.9)
Litter	(63.3)	(34.9)	(17.3)	(36.3)	(47.7)	(56.2)	(56.2)	(56.2)	(56.2)
Soil Organic Carbon	(43.9)	(67.5)	28.0	(1.3)	(36.0)	(34.5)	(34.5)	(34.5)	(34.5)
Harvested Wood	(132.6)	(119.4)	(113.9)	(94.5)	(99.2)	(95.9)	(106.3)	(108.5)	(110.0)
Products in use	(64.8)	(55.2)	(47.0)	(31.9)	(35.1)	(35.4)	(45.5)	(47.3)	(45.3)
SWDS	(67.9)	(64.1)	(66.9)	(62.6)	(64.2)	(60.4)	(60.8)	(61.2)	(64.7)
Total Net Flux	(621.7)	(659.9)	(550.7)	(623.4)	(697.3)	(730.9)	(741.4)	(743.6)	(745.1)

Note: Forest C stocks do not include forest stocks in U.S. territories, Hawaii, a large portion of Alaska, or trees on non-forest land (e.g., urban trees, agroforestry systems). Parentheses indicate net C sequestration (i.e., a net removal of C from the atmosphere). Total net flux is an estimate of the actual net flux between the total forest C pool and the atmosphere. Forest area estimates are based on interpolation and extrapolation of inventory data as described in the text and in Annex 3.12. Harvested wood estimates are based on results from annual surveys and models. Totals may not sum due to independent rounding.

Product Increase in 2006= 45.5 million metric tons CO₂/yr

Forest stock net sequestration (growth minus emissions)= 635 million metric tons